

Upper Mississippi River Nine-Foot Channel Project.

Lock and Dam Number 5A

Winona, Minnesota, vicinity

Winona County, Minnesota

Buffalo County, Wisconsin

HAER No. MN-23

HAER
MINN,
85-WIN.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Rocky Mountain Regional Office
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: Three miles above Winona, Minnesota, Winona County, Wisconsin, Buffalo County, Wisconsin

The area at the time of construction consisted of low, swampy ground separated by three sloughs: Blackbird Slough, Straight Slough, and Crooked Slough. Many small lakes existed in the area, interrupted by areas of relatively high land. The ground cover consisted of heavy underbrush with timber and tall weeds. The lock and dam site was located in the middle of the river channel and incorporated a number of islands into its earth dike system.

Date of Erection: 1934-1938

Present Owner: United States Government
U. S. Army Corps of Engineers
St. Paul District

Present Use: River navigation/hydrology control

Significance: The Upper Mississippi River Lock and Dam Project represents one of the largest and most ambitious of such undertakings. With roots in the Progressive Era, the project was adopted by New Deal proponents to serve the needs of public employment during the Great Depression. Its successful completion turned the upper reaches of one of the world's largest rivers into a intra-continental canal and settled the question of a fully navigable interior river system through the Midwest. Completion of the system helped allay economic inequities in commercial rail and water freight rates brought about as a result of the opening of the Panama Canal. Although significantly altering the environment of the upper Mississippi, the project also served as an impetus for the upgrading of municipal drinking water and sewage disposal systems, as well as providing new recreational opportunities, thus, in the end, proving generally beneficial to public welfare.

Historian: William Patrick O'Brien
October 1987

For a complete history, footnotes and bibliography, see HAER No. MN-20.

LOCKS AND DAMS 3 THROUGH 10--INDIVIDUAL SIGNIFICANCE AND INVENTORIES

The following outlines document specific significant technologies reflected in the construction of the individual lock and dam complexes, calling attention to unique engineering design items. Changes made to various systems since their initial completion are also a part of this section. A number of maintenance changes have occurred at various times since their completion. Changes made before 1970 are not well documented; many were superficial. Complete documentation to system changes is contained in the monthly condition reports filed with the St. Paul District Office by the various installations. Some changes may have been made over the years without benefit of documentation.

Therefore, the following tables should not be interpreted as entirely inclusive.

It should be noted that architectural and engineering components vary significantly from site to site. Architectural styles for gate pier designs fall into two categories: those completed prior to 1935-1936 (1a, 1b) and those completed after those dates (2a 2b). Only one 1a structure exists in the entire Nine-Foot Channel system and is located at Rock Island, Illinois. As such, it is not a part of this study. The 1b structures are characterized by large, multipane windows, hip roofs, and engaged buttress detailing on the gate house piers. The 2a structures are more streamlined in style with slit, three-pane windows, flat roofs, and no buttress details. The 2b structures are identical to 2a elements except for addition of a metal panel in the Roller gate track section of the gate piers that does not occur in 2a structures. Only 1b and 2a architectural types occur in the St. Paul District. Other elements such as central control stations, lockkeepers' residences, and associated structures are standardized, unless other noted.

Dates for the construction of each complex are given from the beginning of initial work to the end of the project and do not necessarily reflect the construction dates of any single element. Complete construction histories for each complex containing exhaustive documentation for the building of the lock, dam, esplanade features, and other attendant installations are on file with the St. Paul District Office. These histories contain comprehensive listings for all general contractors and subcontractors involved in the project as well as a listing for all material suppliers. For the purposes of this study, information regarding contractors and subcontractors has been reproduced as it appears in the construction histories. As a result, certain inconsistencies appear as a matter of course. For example, in some histories the contractor's business location is cited by city. In others, this information is not included. In addition, approximately 10,000 separate construction drawings and illustrations were produced during the project and during the course of maintenance since its completion. Drawings were selected from among these materials to illustrate both standardized elements as well as those pertaining

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to specific sites. Drawing numbers are noted at the end of entries were applicable. "()" indicates elements for which drawings are not readily available. General index sheets have also been reproduced at the beginning of each lock and dam illustration collection for a complete reference. Contemporary photographic documentation, including 16mm film footage served to document the project. Photographs are on file in the St. Paul District Office and at each individual installation. Sixteen millimeter film footage is available in video cassette format from the St. Paul Office.

Dimensions for the movable gate sections are given in approximate figures based on the general notations as found in official Corps publications. For example, Roller gates are generally cited as being standardized as either 60 by 20 feet or 80 by 20 feet. However, in the construction history notations, gate lengths are often given exactly as 88 feet 10-1/2 inches long and 15 feet in diameter. Similar approximations apply to information concerning Tainter gate elements. Measurements in both instances should be taken only as approximations for use in categorizing the various sizes and styles of installations and not as an exact measure per se.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Dates of Erection: 1934-1938
2. Architect/Engineer: U. S. Army Corps of Engineers
3. Original and Subsequent Owners: United States Government
4. Builders, Contractors, Suppliers:
 - a. General contractor--lock construction: McCarthy Improvement Company, Davenport, Iowa
 - b. General contractor--dam construction: United Construction Company, Winona, Minnesota
 - c. Other Work: Minneapolis Dredging Company (construction history for dam element presently unavailable).
5. Original Plans and Construction: U. S. Army Corps of Engineers

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6. Alterations and Additions:

<u>Items</u>	<u>Year</u>
Opening placed in fixed concrete spillway	1940
Repaint main and auxiliary lock Miter gates	1957
Repair and repaint Roller and Tainter gates	1960
Recondition main lock Miter gates (lock dewatered but no report compiled)	1960
Investigate corrosion of end of steel sheet piling from cutoff wall, 25 feet from landward slide of upstream abutment wing wall, on Wisconsin side	1963
Rock protection material installation	1964
Deep well pump installation	1966
Second opening placed in fixed concrete spillway	1972
Install new crane on dam	1981
Resurface top of lock and guide walls	1979-84
Repaint auxiliary Miter gates	1980
Paint gates	1982-83
Install spare control cables	1983
Scour repair--lock	1983
Scour repair--dam	1983
High mast lighting	1984

B. Historical Context

The original plan for the lock and dam system did not include this installation. However, due to pooling problems projected as a result of the construction of Lock and Dam 6 in conjunction with the city of Winona and resultant flooding problems, the project was given a "B" priority and was the fourth structure in the project scheduled for completion. The lock and dam were completed in 1935 and 1936, respectively. Other work, including the construction of a 4.05-mile earth dike, power, control and lighting systems, lockkeepers' dwellings, and a garage/pumphouse, was considered complete in 1938. The location for the complex in a slough on the left side of Islands 67 and 68 allowed for the main channel to serve an exclusive spillway function.

The movable section of the dam consists of five 3-foot submersible Roller gates, 80 by 20 feet, and five non-submersible Tainter gates, 35 by 15 feet. A 1,000-foot overflow spillway, 5,344-foot earth dike, and a connecting stub dike also were completed as part of the project. Information regarding manufacture and installation of the gates is presently unavailable.

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The main lock consists of the standard 110 by 600 feet dimensions with standard auxiliary lock elements. Foundations consist of piles in sand. Lock lift is 5.5 feet. Upper normal pool elevation is 651 feet. Depth on upper Miter sill is 18 feet; lower Miter sill is 12.5 feet. The complex was opened to navigation in 1936.

PART II. TECHNOLOGICAL INFORMATION--LOCK

A. General Statement:

1. Architectural character: standardized Ohio-Mississippi lock design. Drawing number: 5A-20-1.
2. Condition of fabric: good.

B. Description of General Layout and Principal Elements:

1. Overall dimensions: 110 by 600 feet. Drawing number: 5A-20-1.
2. Foundations: wood and steel sheet pilings in sand. Drawing number: (5A-20-A)
3. Walls: reinforced monolithic concrete.*
4. Structural system: see above.
5. Bulkheads: concrete bulkhead configurations occur at each end of the riverward lock wall.*
6. Upper and lower guide walls: monolithic reinforced concrete walls extending out from the lock chamber at either end to assist in the guiding of barge traffic into the lock. Upper guide wall extension on the upriver side connects to the protection dike on the Minnesota side of the river. Drawing number: 5A-20-28.
7. Stage recorder: small concrete housing located at the end of the lock guide wall. Equipment housed for the recording of river stages. Drawing number: (5A-77-1).

C. Mechanical Equipment:

1. Operating house: controls for lock gates and Tainter valves housed in small buildings on lockwall. Drawing number: (5A-25-1, 5A-28-A, 1)

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3. Gates: two Miter gates balanced on stainless steel pintels operated by gear arm system and electric motor assemblies. Bumper lines on interior of lock also of stainless steel. All other associated metal parts are of steel, stainless steel, or steel/nickel alloy. Drawing numbers: (5A-21-1, 28; 5A-22-1).
4. Lighting: various freestanding single and double head lighting standards, ca. 1935. Drawing numbers: (5A-OCL-26, 27, 28, 29).
5. Plumbing: lock is watered by four cable-drive Tainter valves serving a system of cast-in-place tunnels that enable the water level to be controlled on the interior of the lock. Drawing number: (5A-21-28).
6. Winch: motorized assembly to assist towing of barges through lockage.*

D. Other Elements:

1. Auxiliary lock: fixed Miter gate without machinery and partial walls located to the riverward side of the lock complex. Equipped with wells for machinery placement. Never completed or put into service.*

PART III. TECHNOLOGICAL INFORMATION--MOVABLE DAM

A. General Statement:

1. Architectural character: type 2a Roller gate piers have large beveled corners and are elephantine in nature. Drawing number: 5A-40-1.
2. Condition of fabric: excellent.

B. Description of Exterior:

1. Overall dimensions: 682 feet in length. Drawing number: 5A-40-1.
2. Foundations: Wood and steel sheet pilings in sand. Drawing numbers: 5A-40-4, (5, 6).
3. Operating house walls: monolithic reinforced concrete. Drawing numbers: (5a-41-1, 2)
4. Structural system: monolithic concrete/structural steel. Drawing number: 5A-40-2.
5. Bulkheads: concrete bulkheads located at the base of each Roller gate pier.*

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6. Operating house openings: two doorways and 13 three-pane slit windows for each Roller gate operating house. Drawing number: 5A-40-1.
 - a. Doorways and doors: 12*
 - b. Windows: 78*
 7. Operating house roof:
 - a. Shape, covering: flat roof covered in membrane/tar composition*
 - b. Towers, piers: six Roller gate piers and operating house towers; one access tower. Drawing numbers: 5A-40-1, (5A-41-1, 2).
 8. Access bridges:
 - a. Shape: arched spans in a segmental series
 - b. Materials: structural steel. Drawing numbers: (5A-53-3, 4, 8, 11)
- C. Description of General Layout and Principal Elements:
1. Access plans: plan of access consists of a simple stairway to the initial pier operating house, each installation being connected by an access bridge/rail track in a linear series. Drawing number: 5A-40-1.
 2. Stairways: reinforced concrete with pipe railing*
 3. Flooring: reinforced concrete*
 4. Wall and ceiling finish: reinforced concrete*
 5. Hardware: brass*
- D. Mechanical Equipment:
1. Movable gates--Roller type: five 3-foot submersible Roller gates, 80 by 20 feet, operating on tooth track and independent chain-drive hoist machinery, with position gauge located on the interior of the headhouses. Drawings numbers: (5A-47-1,2).
 2. Movable gates--Tainter type: five non-submersible Tainter gates having independent chain-driven hoist machinery. Drawing numbers: (5A-A-1, 2, 7); 5A-55-6.

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3. Lighting: fixtures as of time of installation ca. 1935. Rewiring may have taken place over the years--extent is unknown. Drawing numbers: (5A-PCL-26, 27, 28, 29).

E. Other Elements:

1. Earth dikes: a linear non-submersible dike with riprap revetment topped with nine inches of road surfacing west of spillway section incorporates existing islands into its configuration. The earth dike is located on the landward side of the lock section and extends to the southwest, northwest, and west along the Minnesota riverbank. A protection dike of similar construction runs north and west from the upper guide wall extension of the lock and incorporates Islands 66 and 67 as part of its configuration. Stub dike elements also are part of the complex. Drawing number: 5A-52-14.
2. Spillways: a 1,000-foot convex spillway section of reinforced concrete interrupts the earth dike southwest of the lock wall. Drawing number: 5A-40-48.
3. Roller gate bulkheads: temporary blocking units of structural steel girder construction placed in gate openings in period of emergency or repair.*
4. Bulkhead car/tracks: car designed to store and access bulkheads. Located in storage yard.*
5. Flatcar assembly: car for the transport of gate bulkheads and repair materials.*
6. Movable crane: vertical lift crane (replaced ca. 1980) used for the moving of parts and equipment. Operates on track system attached to girder spans. Drawing number 5A-57-1 for original "B" type unit. Drawings of replacement unit available from St. Paul District Office.
7. Storage yard: area surrounding the last Tainter gate pier on the Wisconsin side. Contains replacement parts for gates, bulkheads on track cars, and related repair items.*
8. Boat launch: single-armed launch of metal construction. Installed ca. 1985.*

PART IV. TECHNOLOGICAL INFORMATION--ESPLANADE AREA

A. Description of Esplanade--General Layout:

1. Design character: standardized park/service area components. The esplanade area was originally designed to accommodate the central control station, lockkeeper's and assistant lockkeeper's residences, parking, and other service-related functions. Lock and Dam 5A is unique from other installations in that its esplanade area is separated from the central control station by the movable dam and lock elements. Major site alterations have occurred since that time and are noted in the following items. Drawing numbers: 5A-38-11, 12.
2. Historic landscape design: based on standardized designs--see drawings for esplanade and lockkeepers' residence. Drawing number: 5A-38-17.

B. Condition of Site and Structures: Altered.

1. Central control station--exterior: standardized construction. Hip roof; concrete stucco finish. Drawing numbers: (5A-70-1, 2, 5, 6).
 - a. First floor contains central control panel and room, bathroom, main office, and basement stairway access. Drawing numbers: (5A-70-2), 5A-71-1.
 - b. Basement contains storage and equipment rooms. All interior finishes altered from original construction.*
2. Lockkeeper's/assistant lockkeeper's residences: standardized Colonial Revival with side porch. The structures have been moved off site to locations in the Centerville, Wisconsin, vicinity. Drawing number: (5A-10-10).
3. Outbuildings: various sheds and service buildings have been erected from time to time as demands required. None have particular significance or contribute to the site. One small, frame storage building still exists on site from the ca. 1935 period. A large garage structure of metal and steel was erected on the old site of the lockkeeper's residence, ca. 1985.

C. Other Elements:

1. Pedestrian underpass: reinforced concrete pedestrian underpass gives access to the movable dam section, passing under an active railway line between the esplanade area and the movable dam. The element is standardized.

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PART V. SOURCES OF INFORMATION

- A. Original Architectural Drawings: St. Paul District Office, Construction Drawings--Nine-Foot Channel Project 1027-1984. Passim.
- B. Early Views: Construction Photographs: Lock and Dam 5A--Photograph Log Books
- C. Interviews: Personnel, Lock and Dam 5A
- D. Bibliography:
 - 1. Primary and unpublished sources: National Archives, Record Group 77; Construction Histories--Lock and Dam 5A; see bibliography, HAER No. MN-20.
 - 2. Secondary and published sources: see bibliography, HAER No. MN-20.
- E. Likely Sources Not Yet Investigated: National Archives, Record Group 77, Suitland, Maryland; St. Louis, Missouri.
- F. Supplemental Material: Aerial Photographs, U. S. Army Corps of Engineers, St. Paul District.